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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/774,778

02/09/2004

Gregor Dudziak

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EXAMINER

MENON, KRISHNAN S

ART UNIT

PAPER NUMBER

1797

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/774,778	<b>Applicant(s)</b> DUDZIAK ET AL.	
	<b>Examiner</b> Krishnan S. Menon	<b>Art Unit</b> 1797	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 May 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2,6-8 and 10-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,6-8 and 10-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### **DETAILED ACTION**

Claims 1,2,6-8 and 10-17 are pending as amended 5/12/09 in the RCE of 3/17/09.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1,2,6-8,10-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims recite a membrane having a hydrophobic coating, and a mean pore diameter of 2 nm to 5 nm. Paragraphs 0020 and 0021 appear to disclose the membrane as an inorganic membrane having pore size 2 nm-5 nm (not the membrane after hydrophobic coating). The claim language is confusing as to what is included as “membrane” – is it just the inorganic membrane, or the hydrophobic coated inorganic membrane?

The antecedent basis for the term “membrane” is unclear.

For the purpose of examination, the membrane is considered as the inorganic membrane having 2-5 nm pore size, and the hydrophilic coating is over this membrane. Thus the pore size 2-5 nm is considered as that of the membrane before the hydrophilic coating.

***Claim Rejections - 35 USC § 103***

1. Claims 1,2,6-8,10,11 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Karau, et al (US 6,472,571).

Karau teaches a process for separation from a non-aqueous homogeneous or colloidal solution of a catalyst (abstract, column 2, lines 38-44), with a ceramic membrane having a hydrophobic coating of alkoxysilanes as claimed (see the silanes in column 3, lines 45-67).

Membrane porosity is less than 10 nm preferred (column 4, lines 1-10).

Particularly, the reference teaches that the pore size should be optimized to obtain high product flow rate while obtaining the highest retention ability: see excerpt below:

**4**

The average pore diameter in the inorganic separation membrane should be dimensioned such that an economically meaningful product flow is ensured with as high a retention ability as possible. The pore diameter should preferably be greater than 0.1 nm, particularly preferably greater than 0.4 nm. The interlayer used should exhibit an upper average pore diameter of less than 200 nm, particularly preferably less than 10 nm, most particularly preferably less than 1 nm.

Regarding the retention of <1000 g/mol, the reference teaches a membrane with a rejection layer similar to or the same as what is disclosed by the applicant – a ceramic layer having pore size which encompasses the range claimed, as well as a teaching of optimizing such a pore size to maximize the flux and the rejection. The reference also teaches very high retentions ( >96%) of 4000 g/mol. Applicant's definition of retention is having a retention of 90% or more. Since the membrane material is the same or similar, and the reference does teach of optimizing the membrane to obtain the desired

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retention, it would be inherent and obvious to one of ordinary skill in the art that the reference is capable of having the claimed retention.

Regarding the three separate ceramic layers, the reference does not explicitly teach three ceramic layers, but simply a ceramic support layer and a ceramic interlayer. It is well known in the art that the actual membrane is the surface layer that comes in contact with the solution to be filtered or separated. In this case, it is the silane-coated surface. The reference teaches in column 3:

In principle all inorganic membranes familiar to the person skilled in the art that display an inorganic backing layer and an inorganic interlayer can be used as membranes. The interlayer forms the actual small pore diameter required <sup>40</sup> for retention, whereby this can be modified using organic groups known to the person skilled in the art in order to modify its separation properties (e.g. hydrophobia and hydrophilia).

And in column 4, starting at line 9:

"As has already been indicated, advantageous membranes are those exhibiting a structure wherein the backing layer of the membrane consists of one or more inorganic oxides, preferably aluminium oxide and/or SiO<sub>2</sub>. One or more interlayers consisting of one or more inorganic oxides, preferably titanium oxide, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> and/or zirconium oxide, can moreover be applied to this backing layer. As indicated above, it can be advantageous to modify the interlayer additionally with organic components."

[Underline by Examiner]

See the portion underlined in the above excerpts taken from the reference.

Ceramic is alumina, etc (column 4, lines 9-17)

Non-aqueous solvents taught; specific examples are THF and methanol. (tables 1 and 2, examples)

Temperature is in the range claimed – column 2, 3-10; more over, the range includes ambient, and unless the reference specifies a temperature, ambient temperature would be implied. Pressure required for the membrane process also would be implied in the reference, unless applicant can show criticality of the range.

Applicant's arguments traversing this rejection are not persuasive.

Interpretation of claim 1: Claim 1 recites in part relevant to applicant's arguments (prior to 8/8/08) traversing this rejection:

Claim 1 (**currently amended**). Process for the separation from a non-aqueous solvent of a **solid** substance which is present in said non-aqueous solvent in dissolved form, colloidal form, or in both of such forms, **without changing the molecular weight of said solid substance**, which comprises passing said non-aqueous solvent through a membrane having:

The emphasized part of the claim requires that the substance in dissolved or colloidal form is solid; and its molecular weight should not change during the claimed process, that is, its molecular weight should not change while being separated from the non-aqueous solvent using the membrane.

The reference teaches use of a ceramic membrane, as claimed, in recovering dissolved or colloidally soluble catalyst (column 2, lines 29–64). The reference does not teach synthesizing the catalyst, but only teaches using the catalyst for synthesizing organic compounds. The term 'increased molecular weight' in this reference appears to mean only having a *higher molecular weight*. The office does not believe that the

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catalyst is somehow growing in molecular weight in the process described in this reference. This is evident from the paragraph at column 4, lines 32-41. This paragraph teaches about catalyst “Catalyst having increase molecular weight made from dendritic, linear or variously branched homopolymer ...”, etc., which only explains the source for the catalyst. Column 5, lines 17-25 teaches the definition of the “increased molecular weight” as:

*“In the context of the invention the term increased molecular weight refers to the increase in molecular weight of the catalyst under consideration by means of adsorptive or covalent bonding to appropriate organic or inorganic homogeneously or colloidally soluble support materials, e.g. nanoparticles (Zhao et al. Angew. Chem. 1999, 111, No.3).”*

Example 2 in the reference teaches the process as claimed, wherein a catalyst of molecular weight 38kD dissolved in THF is used to reduce tetralone to tetralol, which is circulated through a ceramic membrane.

Moreover, even if the reference had taught the catalyst molecules as ‘growing’ in molecular weight, it would still be obvious to one of ordinary skill in the art at the time of invention to have this same process for separating the catalyst from the solvents as taught by this reference to contain the catalyst in the reacting vessel as taught by the reference. See column 1, lines 20-40.

Argument that the Karau reference teaches catalyst of increased molecular weight (or larger molecular weight) is not commensurate in scope with the claim or the rejection. The claims are not limited by the molecular size of the catalyst. However, adding such a limitation to the claims also would not make the claims patentable – it would be inherent in the teaching of the reference, because the membrane of the

reference would separate any dissolved substance whose molecular weight above the cut-off molecular weight of the membrane. The molecular weight of the Karau reference does not increase in molecular weight during the process.

2. Claims 12-14 are rejected under 35 USC 103(a) as being unpatentable over Karau as applied to claim 2 above, and further in view of WO 01/07157.

Claims differ from the reference in the teaching of the specific type of catalyst, i.e., organometallic catalyst from certain groups of the periodic table. However, the Karau reference teaches that the process of separating catalyst from reacting mixtures to retain them in the reactor is well known in the art, and the focus of the Karau invention is on the inorganic membrane for this purpose, as well stated in the column 1 of the reference. . WO teaches a process for separating solutes or colloids such as catalysts (page 7, 8: rhodium-organophosphite complex) from a non-aqueous solution. Membrane is ceramic (alumina, zirconia: page 10), with coating (the sub-nanoporous coating of metal or ceramic or inorganic polymeric material is a coating (page 7) (but WO does not teach the specific silane claimed). It would be obvious to one of ordinary skill in the art at the time of invention to **combine these references to extend the use of Karau for the catalysts as taught by WO**. One would use the Karau membrane for such applications as taught by WO because of the advantages of Karau membrane, such as extremely high retention ability of the catalyst, as taught in column 2, lines 51-64.

Arguments traversing this rejection are not persuasive.

Argument that “Karau needs to increase the molecular weight” has no basis, as has been discussed repeatedly. Arguments are not responsive to the rejection, nor commensurate in scope with the claims.

### ***Response to Arguments***

Applicant's arguments are addressed in the rejection.

Additionally, arguments relating to the claim language:

**wherein the membrane is an asymmetric, porous ceramic membrane, comprising at least three ceramic layers, each of which has a pore size different from the other two layers, and**

is not persuasive.

Applicant argues that the Karau ceramic membrane has only two layers, the ceramic base layer and the ceramic interlayer. Only the interlayer has a specified pore size range of 0.1-200 nm (broadest) and 0.4-1 nm (narrowest). Karau does not specify the pore size of the base layer, and therefore, does not teach that the pore size of the two layers should be different.

This argument has been discussed before and it was clearly pointed out that it has no merit. Especially, it is well known in the art that the actual rejection is a surface phenomenon, and the surface pores of the membrane controls the rejection and the flow properties. Thus it is the first layer in the membrane that controls. I Karau, the “interlayer” of the membrane controls, and when the organic hydrophobic coating is applied, it controls the rejection and the flow. The base layers are for supporting the rejection layer. Karau teaches that there can be one or more interlayers, and the

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base layer. Thus it naturally flows that the top most layer has the smallest pore size, and subsequent layers underneath would have increasing pore sizes. This is clear from the paragraph quoted above in the rejection, and repeated below:

In principle all inorganic membranes familiar to the person skilled in the art that display an inorganic backing layer and an inorganic interlayer can be used as membranes. The interlayer forms the actual small pore diameter required 40 for retention, whereby this can be modified using organic groups known to the person skilled in the art in order to modify its separation properties (e.g. hydrophobia and hydrophilia).

[Column 3, lines 37-44]

Therefore, without having secondary evidence to show that the three layers in applicant's claims have contributions to the performance resulting in unexpected results, the claims are not patentable on this issue.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krishnan S. Menon whose telephone number is 571-272-1143. The examiner can normally be reached on 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on 571-272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Krishnan S Menon/  
Primary Examiner, Art Unit 1797